Eye Wash Guide

Rinsing solutions for first aid in case of eye accidents

This guide offers you important information on first aid irrigation fluids suitable for rinsing eyes in case of accidents. Always keep in mind - you only have two eyes!

plum

The eye

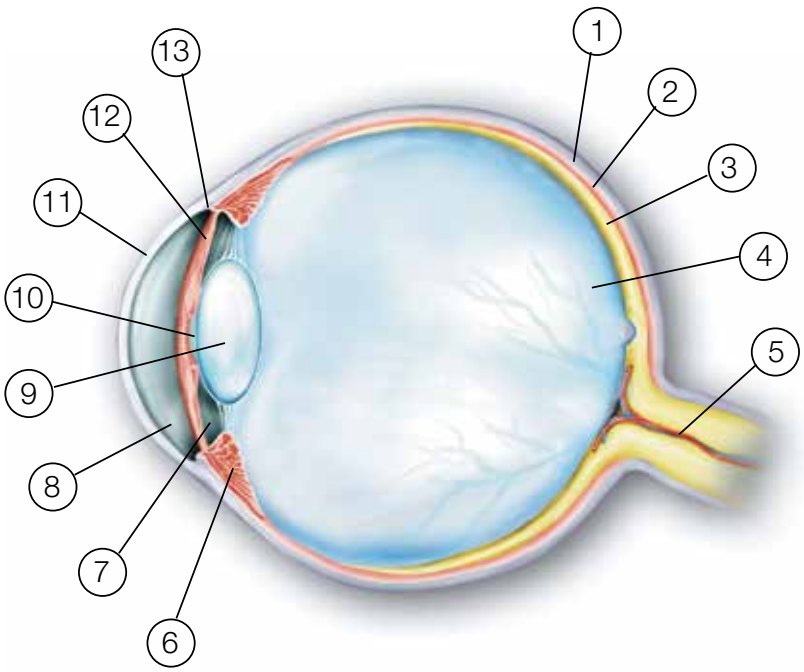
Sight is one of our most important senses.
Therefore, it is of great importance to protect your eyes also while working. In spite of safety precautions a lot of workplaces still bear risks of eye injuries. Using an effective eye rinsing solution helps reducing the extent of the injury.

Structure and function of the eye

The human eye consists of many small parts important for the sight.

The light crosses the cornea and reaches the anterior chamber of the eye filled with aqueous fluid. The incidence of light is regulated by the iris. The refraction is done by the lens. The vitreous body fills the eye socket behind the lens.

The retina is the most important part of the eye because it is responsible for the visual function. Here all incoming impulses are transformed into a vision and forwarded to the brain.



The eye
1: Sclera
2: Choroid
3: Retina
4: Vitreous body
5: Visual nerve
6: Ciliary body
7: Posterior chamber of the eye
8: Anterior chamber of the eye
9: Lens
10: Pupil
11: Cornea
12: Iris
13: Schlemm's canal

Risks at work

Mechanical injuries

A large proportion of eye injuries are caused by mechanical influences, primarily foreign bodies.

- Shavings
- Wood chips
- Metal splinters
- Grit
- Dust
- Dirt

Foreign bodies can cause both superficial and internal injuries such as bruising and bleeding. The severity of the eye injury is dependent on the force and shape of the foreign body.

A foreign body that enters the eye with great force can damage the cornea and penetrate the eye, often resulting in severe injuries to the lens and the retina.

Bumps and bruises also have to be taken into account in industrial practice. Sight is often severely impaired or even completely destroyed by such incidents.

Chemical injuries

Chemicals can penetrate the eye in the form of a solid, liquid or gas.

The most common injuries at work are chemical burns caused by liquids. In these cases acids and alkali can cause serious tissue damage. If a chemical penetrates the cornea the damage is often very severe. The extent of the injury is influenced by the following factors:

- Concentration of the chemical - strong acids and alkali have a greater risk of causing burns
- Temperature - a high temperature increases the burning properties of the chemical
- Duration of contact - the deeper the penetration the greater risk of serious injury

Rinsing solutions for immediate treatment after an accident

In cases of eye injuries a rinsing solution is of great importance to minimize the damage caused. The rinsing solution should have the following qualities:

- Effective also against exposure to chemicals
- Easy and quick to use
- Directly available at workplaces with high risks of eye injuries

In the event of a chemical exposure, begin eye irrigation immediately and remove contact lenses as soon as practical. Do not delay irrigation while waiting for contact lens removal.

Important note

Medical advice should always be sought in the case of eye injury. This also applies to injuries which may first appear harmless.

The effects here can often be very serious. Continued rinsing with 0.9% sodium chloride solution is hence recommended whilst travelling to a doctor or hospital.

Subsequent treatment of the injury is then the responibility of the treating physician.

Rinsing solutions for foreign bodies

Foreign bodies need to be flushed out of the eye. A sterile sodium chloride solution with the same salt content as the eye fluid has proved its worth as an eye wash. The bottles are available with a shelf life of 3 years. No maintenance is necessary and a high degree of reliability in use is assured. Nor is there any risk from bacteria and germs that could lead to eye infections. When ordinary water or a non-sterile liquid is used for irrigation it must be remembered that microbial contamination can arise already after a short time. That is why eye wash bottles containing ordinary water require regular maintenance with the water having to be replaced and the bottles cleaned.

A special ergonomic eye cup on the bottles ensures that the liquid can be applied in an even and gentle flow. Moreover, the injured person can start rinsing without assistance. The outlet nozzles make prolonged rinsing possible.

Several eye accidents involve both eyes. The DUO eye wash bottles are equipped with a special eye device that allows rinsing of both eyes at the same time.

Rinsing solutions for acids and alkali

Dangerous chemicals are everywhere

In a large number of jobs, businesses and industries, you are particularly exposed to serious eye injuries caused by chemicals. In airports, chemical factories, the recycling industry, in cement factories and on construction sites, in the food, metal, paper and mining industry, or in the petrochemical industry. Strong acids and alkali are used in the production and in connection with cleaning. The risk that something will go wrong, for example, because a hose comes loose or a battery explodes, is part of everyday life. You need pH Neutral at hand.

Just a few seconds can make all the difference

Acids and alkali break down the structure of skin and mucosa membranes. In connection with eye injuries involving acids and alkali, it is important to neutralize the chemical as quickly as possible to a pH level of about 7.4, corresponding to the normal pH level of the eye's fluid - preferably before the acid or alkali has penetrated into the cornea.

The eye wash liquid must be effective

pH Neutral is a 4.9% phosphate buffer that will quickly and effectively neutralize even very strong acids and alkali. The liquid consists of phosphate salts that are present in the body. The hydrogen phosphate buffer is effective against acids, whereas the dihydrogen phosphate buffer reacts against alkali. The effect of pH Neutral has been documented in scientific studies.[1) 2)]

We have tested the neutralizing effect of pH Neutral for both strong acids and alkali compared with the effect of ordinary eye wash with 0.9% sodium chloride. The test clearly shows that pH Neutral will quickly neutralize both acids and alkali to a harmless pH level. Ordinary eye wash dilutes the liquid, but only small changes to the pH value are obtained (Figure 1).

IMPORTANT

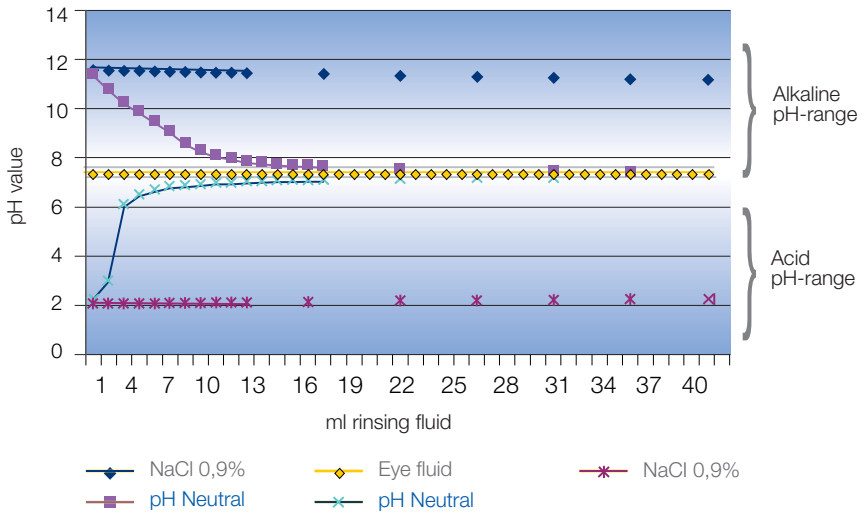
Reservation is made for hydro-fluoric acid, which is toxic and highly corrosive to skin and bones.

pH Neutral and Plum Eye Wash may neutralize and rinse, but not limit the corrosive effect. Therefore, they are not recommended as first aid in connection with eye accidents involving hydrofluoric acid.

Recommended use of pH Neutral

pH Neutral is a two minutes eye wash solution for accidents involving acids and alkali. Rinse with pH Neutral in order to reduce the pH value of the harmful substance to a harmless level as quickly as possible. Then continue rinsing with Plum Eye Wash 0.9% sodium chloride until you reach a doctor or the emergency room.

Figure 1: Neutralizing effect of pH Neutral and 0.9 % sodium chloride*



* A titration test made in laboratory (in vitro) by Plum A/S. The test was made by step wise adding pH Neutral and 0.9 % sodium chloride to a solution containing 1 drop of sulphuric acid + 40 ml water respectively 1 drop of potassium hydroxide + 40 ml water. The change in pH value and the amount of rinsing fluid used were measured.

[1)] Prof. Dr. med. Schrage N.F., Facharzt für Augenheilkunde an der Augenklinik Merheim, Ostmerheimer Str. 200 in 51109 Köln, in Kooperation mit dem Aachener Centrum für Technologietransfer in der Ophthalmologie ACTO, Geschäftsstelle Karlsburgweg 9 in 52070 Aachen, Vortrag: Augenverätzungen - Was gibt es Neues? Regionalforum Arbeitsmedizin, Stuttgart 23.02.2006, Folien 44 ff..

[2)] Professor Dr. med. Schrage N.F., Facharzt für Augenheilkunde an der Augenklinik Merheim, Ostheimer Str. 200 in 51109 Köln, in Kooperation mit dem Aachener Centrum für Technologietransfer in der Ophthalmologie ACTO, Geschäftsstelle Karlsburgweg 9 in 52070 Aachen,Vergleichsergebnisse von pH Neutral an verätzten Augen, Spülversuche an mit NaOH verätzten Kanichenaugen im Vergleich von Plum pH Neutral mit physiologischer Kochsalzlösung, 24.05.2005

All documentation is available on request.

When to use Plum pH Neutral Eye Wash

pH Neutral is a buffer with high buffer capacity. It is designed to be used as immediate first aid irrigation solution for eye accidents caused by an acid or alkali. The rinse solution is intended for a 2 minutes rinsing duration.

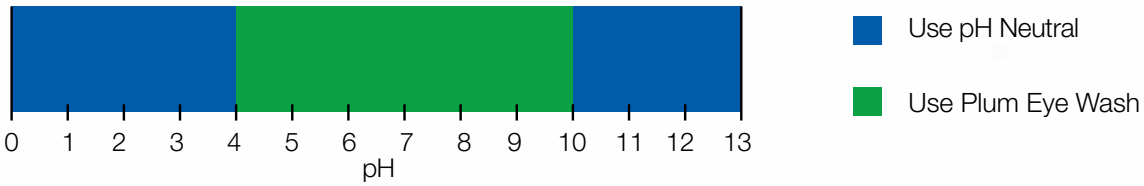
pH is a mathematical term that describes the concentration of hydrogen ions (H+) or hydroxide ions (OH-) in a solution. If a solution contains hydrogen ions it is acidic (pH < 7), whereas the solution is alkaline, if it contains hydroxide ions (pH > 7). In a neutral solution the pH value is 7.

Solutions with pH values below 4 and above 10 impose a risk of corneal burns if eye splashes occur.

Note: If measurable, the pH for a chemical is given in section 9 of the safety datasheet.

Plum recommends that pH Neutral is available when working with chemicals with pH values either below 4 or above 10. If the pH value is between 4 and 10 or not given in the safety datasheet for the given chemical, Plum recommends the use of Plum Eye Wash (0.9 % NaCl, saline) in case of eye splashes. This is illustrated in the figure below.

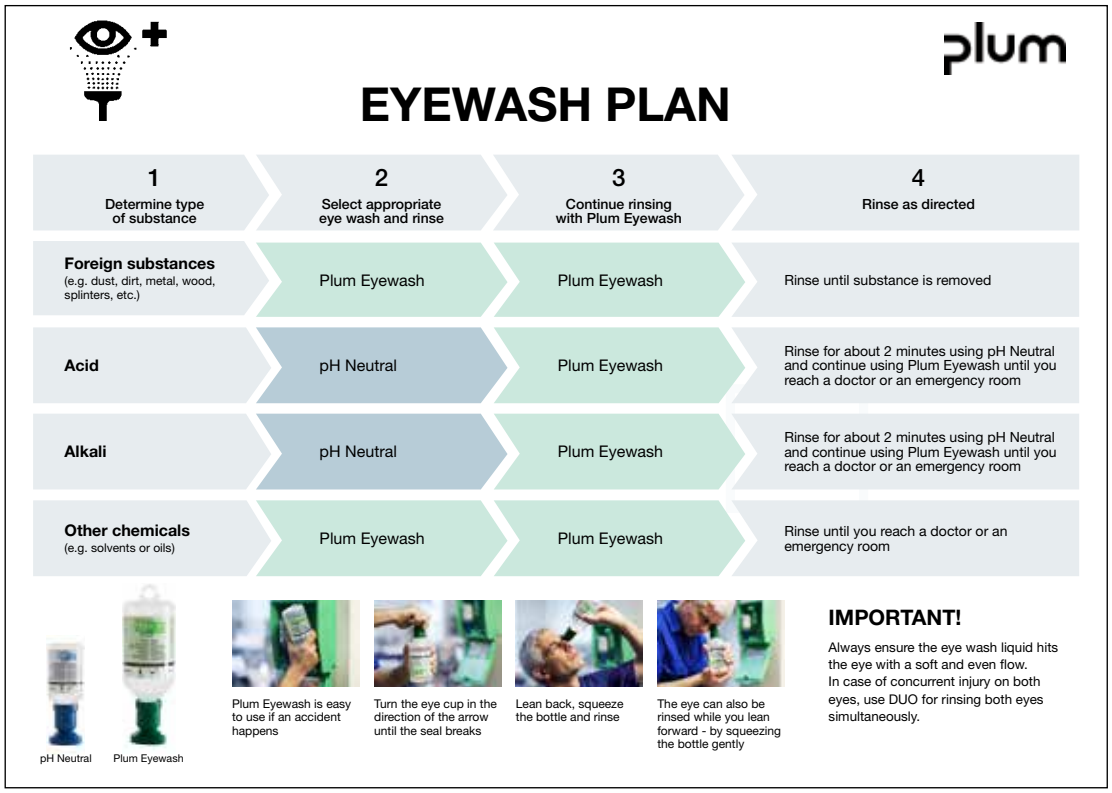
Independent of the pH value of the chemical there is no risk combined with using pH Neutral instead of Plum Eye Wash. Both pH Neutral and Plum Eye Wash work by physically removing the chemical from the eye, but in addition to this pH Neutral will neutralize any acidic or alkaline solutions.



Eye Emergency Plan

Our first aid plan for eye injuries shows you with ease and simplicity how rinsing should be carried out after contact with various dirts and pollutants.

You can order this plan separately and display it for your employees in at-risk areas of work.



Eye rinse bottles in different sizes and models

Here we show you a selection of our eye rinse bottles. An overview of our entire sortiment can be found in our First Aid Brochure.

The large product assortiment guarantees that you obtain the best solution for your unique demands, whether it is stations for wall montage in various sizes or hand-held solutions for mobile usage.

In the case of an accident the DUO bottles with their special eye cap enable both immediate and simultaneous rinsing of eyes.

All bottles comply with DIN EN 15154-4 and can be kept unopened for up to 3 years.

Maintenance and cleaning of the bottles is not required.

DIN EN 15154-4 Emergency Safety Showers – Part 4: Regulates the performance requirements for eye showers without water supply.

For foreign bodies – 0.9 % sodium chloride solution

200 ml Plum Eye Wash		**Art.Nr.:** 4691 Rinsing time: c 2 minutes
500 ml Plum Eye Wash		**Art.Nr.:** 4604 Rinsing time: c 5 minutes
1000 ml Plum Eye Wash		**Art.Nr.:** 4707 Rinsing time: c 10 minutes
500 ml Plum Eye Wash DUO		**Art.Nr.:** 4861 Rinsing time: c 2 minutes per eye
1000 ml Plum Eye Wash DUO		**Art.Nr.:** 4800 Rinsing time: c 5 minutes per eye

For acids and alkalis – 4.9 % phospate buffer solution

200 ml pH Neutral		**Art.Nr.:** 4752 Rinsing time: c 2 minutes
500 ml pH Neutral DUO		**Art.Nr.:** 4801 Rinsing time: c 2 minutes per minute
1000 ml pH Neutral Eye Wash Shower		**Art.Nr.:** 4746 Rinsing time: c 2 minutes

- Ergonomic eye cup
- Clear instructions for use with text and pictograms
- The fluid gets in the eye in a gentle and even flow
- Rinsing time per bottle depending on content is between 2 and 10 minutes

08-2016

Plum A/S
Frederik Plums Vej 2 · DK-5610 Assens
Tel. +45 6471 2112 · Fax +45 6471 2125
info@plum.eu · www.plum.eu

Delivery by trading partners: